

the N. pharyngeus, a branch of the vagus. Pl. phar., the plexus pharyngeus. Pl. tym., the tympanic plexus over the promontory of the tympanum. S., the cephalic cervical ganglion of the sympathetic ganglion, just entad and cephalad of the G. inferius. Ton., the tonsillar branch. Tym., the tympanic ramus or Jacobson's nerve. Vagus, the central 10 mm. of the vagus nerve, showing the relations of the ganglia. 1. Anastomotic filament from G. petrosum to S. 2. Communicating branch to the G. inferius. 3. Branch to the plexus gangliformis; this is the doubtful accession from the N. accessorius. 4. Anastomotic filament to the R. auricularis.

BIBLIOGRAPHY.

For bibliography consult previous papers. The Trigemini Nerve in the Domestic Cat; Proceedings of the American Philosophical Society, Vol. xxiii, pp. 459-478; 1886. Also, The Facial Nerve in the Domestic Cat; Proceedings of the American Philosophical Society, Nov. 5, 1886.

The Accessory Nerve in the Domestic Cat. By T. B. Stowell, A.M., Ph.D.

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Synonymy.—N. accessorius; Accessory of the Par Vagum; Accessory nerve of Willis; Spinal accessory; Superior respiratory; Eleventh pair of encephalic nerves.

General Characters.—This nerve is called accessory because of its large accessions to the N. vagus, in the G. jugulare and in the plexus just peripherad, v. description below; it is called myelic and spinal from the fact of its widely distributed origin along the cervical myel, v. below. The nerve is an attractive study alike to the anatomist and to the physiologist; its origin, distribution, terminal plexuses and its action upon respiratory movements, laryngeal phonation and the heart are equally distinctive. It combines a large group of myelic funiculi with a few from the medulla; by virtue of its accessions to the Vagus it sustains structural relations with the N. pharyngeus and with the N. laryngeus caudalis (Rami of the Vagus), indeed a large share of the motor fibres of the Vagus is referable to the accessions from the Accessorius [Longet, *Système Nerveux*, t. ii, p. 265; Cl. Bernard, *Leçons sur la Physiologie du Système Nerveux*, t. ii, p. 244]; by an anastomotic ramus it joins the N. hypoglossus, and in its terminal filaments it makes numerous plexuses with the cervical myelic nerves. M. Claude Bernard by his method of evulsion demonstrated that laryngeal phonation is due to the action of the accessory nerve. The prolonged cries of many mammals seem to confirm his conclusions and are due, in part, at least, to the rigidity of the cervical muscles in sustained expiratory movements. According to Heidenhain, this accession gives cardio-inhibitory fibres to the Vagus.

DESCRIPTION.

Ectal Origin and Entocranial Course.—The N. accessorius is peculiar in its two-fold origin, the medulla and the myel; the cephalic roots arise in the depression line dorsad of the area ovalis and immediately caudad of the dorsal roots of the N. vagus; the caudal roots arise along the lateral column of the cervical myel, as far caudad as the fifth cervical vertebra (fibres are not infrequently traceable along the entire cervical myel). The confluence of these funiculi forms a nerve trunk whose volume increases from its caudal origin to the foramen of exit. The nerve trunk thus constituted lies entad of the myelic dura opposed to the lateral column of the myel, between the dorsal and the ventral roots of the myelic nerves; its course is cephalad and enters the cranium through the foramen magnum; at the caudal border of the ectal roots of the N. vagus, the N. accessorius turns laterad and perforates the dura just caudad of the Vagus (I have not met with two entocranial trunks, as is sometimes the case in man), and takes its exit from the cranium through the foramen jugulare in the common sheath with the Vagus and the adjacent Glosso-pharyngeus.

Just centrad of the foramen of exit the Accessorius is closely opposed to the G. jugulare (Vagus), to which ganglion it gives a large ramus. This is the so-called accessory or motor root of the N. vagus.

Intercranial Relations and Foramen of Exit.—The N. accessorius traverses the jugular fossa, in which it lies caudad and laterad of the N. vagus, but apparently in a common sheath with that nerve (additional histological research may disclose a separate sheath for each nerve), and leaves the cranium by the foramen jugulare.

Ectocranial Trunk.—The first 5–10 mm. of the ectocranial trunk are involved in the dense plexus, Pl. gangliformis or Pl. nodosus (Fig. Plexus), with the Vagus. This plexus is formed by interlacing fibres of the Vagus, the Accessorius, a few fibres from the Hypoglossus, with numerous embracing and intertwining filaments of the N. sympathicus, and the vessels of this region; it is highly probable that the adjacent N. glosso-pharyngeus with its G. petrosus is involved in this plexus.

Peripherad of the plexus, the N. accessorius lies entad of the A. occipitalis and the V. jugularis (a ramule of the A. occipitalis is dorsi-laterad of the nerve in its ecto-cranial course as far as the A. occipitalis). At the caudal border of the A. occipitalis, the Accessorius bends dorsi-caudad, accompanied by a small arteriole and perforates the M. clavo-mastoideus near its dorsal border, 20–25 mm. caudad of the insertion of the muscle; this point is also dorsad of the cephalic end of the thyroid body.

PRINCIPAL RAMI.

N. clavo-mastoideus.—As the Accessorius perforates the M. clavo-mastoideus a large ramus (Fig. Clv.-Mas. ca.) is given to that muscle; it is accompanied by an arteriole, lies upon the ental surface of the muscle,

and may be traced to the caudad extremity (origin) of the muscle, where it is joined by the anastomosing filaments of the cervical nerves (Fig. Crv.). From the dorsal border of the nerve at nearly the same point a corresponding ramus (Fig. Clv.-Mas. ce.) is given to the cephalic end (insertion) of the same muscle; this ramus also innerves the adjacent cephalic extremity of the M. sterno-mastoideus (Fig. Str.-Mas.).

N. sterno-mastoideus.—Upon the ectal surface of the M. clavo-mastoideus a large ramus from the Accessorius enters the ental surface of the superposed sterno-mastoid muscle. *The shorter or dorsal division* of this ramus (Fig. Ster.-Mas. ce.) lies ectad of the trunk of the Accessorius and supplies the cephalic (insertion) third of the muscle, or that portion cephalad of the point of init of the nerve; *the ventral division* (Fig. Str.-Mas. ven.) is distributed to the thick ventral border of the caudal two-thirds of the same muscle. About 5 mm. peripherad, or at the dorsal border of the M. sterno-mastoideus, where the muscle is crossed by the large trunk of a cervical nerve (2^o), a second ramus (Fig. Str.-Mas. dors.) is given from the Accessorius to the thin dorsal border of the caudal portion of the same muscle. This ramus lies ectad of the cervical nerve and receives from it a large accession. Since this muscle has two sources of nerve-supply, there is throughout the caudal portion of the muscle a more or less frequent anastomosis of terminal filaments.

N. clavo-trapezius cephalicus.—This ramus is given off in connection with the dorsal ramus of the N. sterno-mastoideus; it lies entad of an artery which supplies the cephalic 20 mm. of the M. clavo-trapezius. The nerve enters the ental surface of the ventral border of the muscle, with the artery just named, and sends a ramulus 5–10 mm. caudad of the artery and is distributed to the cephalic fourth of the muscle; the terminal filaments of the nerve may be traced to the dorsi-meson. Near its ectal origin this nerve receives an anastomotic branch from the second cervical nerve.

The main nerve trunk lies entad of the M. clavo-trapezius, crosses the ectal surface of the M. levator claviculæ and continues dorsad of the levator muscle upon the ectal surface of the M. splenius. At the ventral border of the M. clavo-trapezius the N. accessorius receives a large branch from the second cervical nerve which crosses its ectal surface in this region. At the dorsal border of the M. levator claviculæ it sends a slender ramus (Fig. Spl.) to the cephalic portion of the M. splenius.

N. clavo-trapezius caudalis.—About the middle of the M. clavo-trapezius, a large ramus, the N. clavo-trapezius caudalis, separates from the Accessorius and divides into three or four ramuli which enter the ental surface of the M. clavo-trapezius to be distributed to that portion of the muscle which lies dorsad of the M. levator claviculæ.

Between the clavo-trapezius and the acromio-trapezius muscles, upon the side of the neck, and dorsad of the levator muscle, is a narrow intermuscular interval, the *hiatus trapezii* (Fig. Hi.), filled with adipose, connective tissue, a large lymphatic, an artery, the accessory nerve and the cervical plexus of the second and third myelic nerves.

N. acromio-trapezius.—In this hiatus a large ramus (Fig. caudad of Hi.) is sent dorsad to the M. acromio-trapezius, which enters the cephalic border of the muscle and is distributed by 3–4 terminal ramuli to the dorsal portion of the muscle; caudad of the hiatus several (two shown in diagram) rami from the Accessorius enter the ental surface of the muscle.

Caudad of the hiatus (about 5 mm.) a large accession (Fig. Crv.) is received by the N. accessorius, from the cervical plexus. This nerve (myelic) accompanies the artery which appears in the hiatus.

The nerve trunk terminates upon the M. spino-trapezius. The tendon ectad of the *Delta mesoscapulae* marks the caudal border of the acromio-trapezius muscle and the cephalic border of the spino-trapezius; entad of the ventral angle of this tendinous fascia is found the caudal continuation of the N. accessorius, now designated as the spino-trapezius nerve.

N. spino-trapezius.—At the cephalic border of the M. spino-trapezius, the accessory nerve divides into dorsal and ventral rami which may be traced throughout the muscle. Since the muscle is innerved by the thoracic nerves (myelic) as well as by the terminal rami of the Accessory, the terminal filaments of both nerves form an open plexus throughout its tissue.

SUMMARY.

A. ANATOMICAL.

Ectal Origin.—The N. accessorius arises from the lateral column of the cephalic myel and the caudal medulla dorsad of the area ovalis; the myelic roots are apparent as far caudad as the sixth or seventh cervical vertebra.

Entocranial Course.—The aggregation of these numerous roots forms a nerve-trunk which increases in volume from the caudal origin cephalad to the foramen of exit; the trunk is apposed to the lateral column of the myel, lies entad of the dura between the dorsal and the ventral roots of the myelic nerves, enters the cranium through the foramen magnum and extends cephalad in the cranium to the caudal roots of the N. vagus, where it perforates the dura and is associated with the vagus and the glosso-pharyngeus nerves in the foramen of exit.

Foramen of Exit.—The N. accessorius traverses the foramen jugulare with the associated vagus and accessorius nerves, the jugular vein and a small arteriole, a ramulus from the A. occipitalis.

Communicating Rami.

1. Accession to the G. jugulare (Vagus) centrad of the foramen of exit.
2. Several rami to the Plexus gangliformis, 5–10 mm. peripherad of the foramen jugulare (the first of these is the probable accession to the N. glosso-pharyngeus).
3. Accession to the G. inferius (Vagus).
4. With cervical nerves.

Principal Rami—their Ectal Origins and Distributions.

N. clavo-mastoideus.

1. *Caudal ramus*; origin at the ental surface of the M. clavo-mastoideus as the nerve perforates the muscle.

2. *Cephalic ramus*; origin opposite the dorsal border of the muscle. These rami are distributed to the caudal and the cephalic portions of the muscle respectively.

N. sterno-mastoideus.

1. *Dorsi-cephalic ramus*; origin at the ectal surface of the M. clavo-mastoideus, distribution to the cephalic third of the muscle.

2. *Ventral ramus*; origin in common with the preceding, distribution to the thick ventral two-thirds of the muscle.

3. *Dorsi-caudal ramus*; origin at the dorsal border of the M. sterno-mastoideus in connection with the cephalic clavo-trapezius nerve, distribution to the thin dorsal border of the caudal two-thirds of the muscle.

N. clavo-trapezius.

1. *Cephalic ramus*; origin in common with the dorsi-caudal ramus of the sterno-mastoid nerve, distribution to the cephalic fourth of the M. clavo-trapezius; this nerve joins its platetrope in the dorsi-meson.

2. *Caudal ramus*; origin about the middle of the M. clavo-trapezius, distribution by 3-4 palmate ramuli to the ental surface of the caudal portion of the muscle.

N. acromio-trapezius.

1. *Cephalic ramus*; origin in the Hiatus trapezii, distribution to the cephalic portion of the acromio-trapezius muscle; this is the large nerve and extends to the dorsi-meson.

2. *Other rami*; several (two prominent) other rami supply the caudal portion of the muscle.

N. spino-trapezius.

The terminal rami of the Accessorius unite with the thoracic myelic nerves in an open plexus to the M. spino-trapezius.

Myelic Accessions.

Two large accessions from the myelic nerves are received by the trunk of the Accessorius, the *cephalic* is just caudad of the cephalic clavo-trapezius nerve, the *caudal* is just caudad of the hiatus-trapezii.

B. PHYSIOLOGICAL.

The N. accessorius is the motor nerve of the sterno-mastoid, the clavo-mastoid, and the trapezius muscles; it is possibly the source of the motor fibre of the Vagus nerve; it seems to be exclusively motor; its distribution and physiological experiments indicate the absence of sensibility; it is antagonistic to movements of respiration (Cl. Bernard); it controls laryngeal phonation (Cl. Bernard); it is cardio-inhibitory (Heidenhain).

EXPLANATION OF DIAGRAM.

The diagram seeks to present the principal rami and relations of the nerve. Actual measurements and perspective are sacrificed to clearness

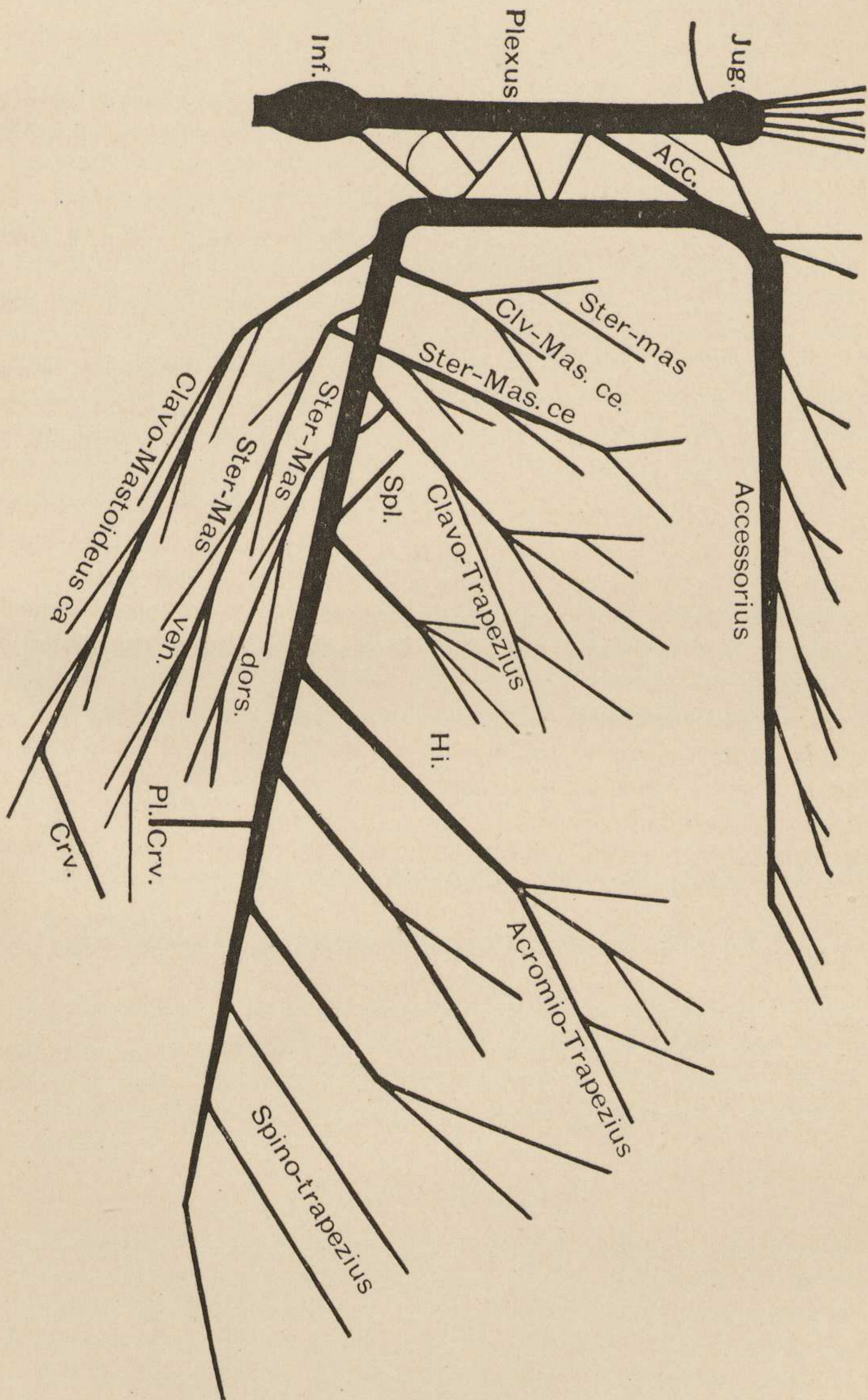


Diagram of the Accessory Nerve.—Stowell.